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MODERN TOOLS FOR SAFE DETECTION OF DISEASES IN SUGARCANE QUARANTINE

J.C. GIRARD, E. FERNANDEZ, M. ROYER and P. ROTT

UMR CIRAD-INRA-Montpellier SupAgro Biologie et Génétique des Interactions Plante-Parasite, Campus International de Baillarguet, TA A-54/K, 34398 Montpellier Cedex 5, France

Summary

Aims: Use of modern molecular tools in disease detection, different detection methods, visual observation, serological tests, PCR or RT-PCR tests have been described for elimination of pests and diseases from infected sugarcane germplasm. Application of strict quarantine measures to control movement of sugarcane germplasm is advocated.

Methods and Results: Improvement of sugar crops relies, to a large extent, upon the cultivation of new sugarcane varieties that are either bred locally or imported from other geographical locations. In either case, there is a need for importing sugarcane germplasm from abroad. Because sugarcane is vegetatively propagated (stem cuttings, tissue-cultured plantlets), there is a high risk of introducing infectious diseases or pests from countries of origin. Therefore, strict quarantine measures must be applied to control movement of sugarcane germplasm. In the past, quarantine procedures relied almost exclusively upon the cultivation of imported varieties in isolated and closed premises (greenhouses), and the access to these areas was limited to a few duly authorized persons. Additionally, visual search for disease symptoms was performed during the entire growth cycle of the plants. These procedures are still in use at present time, but a wide range of tools for detecting and controlling diseases have been developed during the last decades, resulting in quarantine practices that are much safer and reliable. Nowadays, most of the efforts must be focused on the detection and elimination of symptomless or latent diseases such as leaf scald (*Xanthomonas albilineans*), ratoon stunting (*Leifsonia xyli* subsp. *xyli*) or yellow leaf (*Sugarcane yellow leaf virus* or SCYLV). Additionally, special attention must be paid to emerging diseases, the symptoms of which are sometimes rather unusual or difficult to detect, and for which efficient detection tools are not always available. Finally, detection tools must be very efficient in detecting low populations of the pathogen as well as all variants of this pathogen.

Within the last decade, CIRAD's sugarcane quarantine had to face two emerging diseases, streak mosaic (*Sugarcane streak mosaic virus* or SCSMV) and yellow leaf. SCSMV appeared to be a heterogeneous virus, and none of the antisera used allowed us to detect all the isolates of our collection. Fortunately, an RT-PCR test developed in our laboratory has been quite sensitive and efficient. Since the end of the 1990s, sugarcane yellow leaf has been routinely detected in our quarantine using a tissue blot immuno-assay (TBIA) and RT-PCR tests. However, recent studies of the genetic diversity of SCYLV showed that some isolates of this virus were not systematically detected, and new and more universal primers were designed. A similar situation was experienced for the detection of sugarcane mosaic, a disease caused by two variable viruses: *Sugarcane mosaic virus* (SCMV) and *Sorghum mosaic virus* (SrMV). Following genetic diversity studies of SCMV, including virus isolates from various geographical origins, new primer pairs were designed and used in RT-PCR.

Significance of study: Even though modern molecular tools have greatly improved disease detection in sugarcane quarantine, their exclusive use is not advisable. Very often, a combination of different detection methods must be performed: visual observation of the plants at several growth stages, isolation of bacterial pathogens on selective media, serological tests, PCR or RT-PCR tests. Additionally, the use of physical (hot water or hot air), chemical (fungicide and pesticide) treatments and apical meristem culture allow the elimination of many pests and diseases from infected sugarcane germplasm.

Key words: Sugarcane, quarantine, germplasm, diseases, pests, molecular, serological

Corresponding author : J.C. Girard. e-mail: jean-claude.girard@cirad.fr